

OBITUARY NOTICES OF FELLOWS DECEASED.

THE REV. WILLIAM BRANWHITE CLARKE was born 2nd June, 1798, at East Bergholt, county of Suffolk, and educated partly in his father's house, under the Rev. R. G. Suckling Browne, B.D., a distinguished Hebrew scholar, and Fellow of Dulwich College, and partly at Dedham Grammar School; he entered into residence at Jesus College, Cambridge, in October, 1817. He took his degree in January, 1821, and in 1824 became M.A.

In May, 1821, he received deacon's orders from Dr. Bathurst, Bishop of Norwich, and priest's orders in May, 1823.

From May, 1821, to November, 1824, he was trained as curate at Ramsholt, at Nedging and Whatfield, at Chellesworth and Brantham, and then in his native parish. He took advantage of his rector's permission to travel every year, and thus laid the foundation of practical application of the geological and mineralogical lessons he had received at the University, under Professor Sedgwick and Dr. E. Clarke, the great traveller. He made a personal examination of the most celebrated formations of Europe. He travelled extensively in England and Wales and on the Continent from 1820 to 1839, not omitting a single year. He thus visited the Lake District, the Isle of Man, Staffordshire, Derbyshire, North Wales, the chalk and oolite of Yorkshire and Lincolnshire, the chalk of Sussex and Normandy, the central and southern parts of France, the Alps and North of Italy, the Netherlands, Rhenish provinces, Prussia, Belgium, the Ardennes, the tertiary districts of Nassau, the volcanic districts of the Rhine and Moselle. In 1829 he completed his survey of the counties of Suffolk, Norfolk, and Essex. In 1830 he visited the chalk districts and older formations of the frontiers of France and Belgium. Then followed Dorsetshire, West of England, Isle of Wight, Sussex, South-west of England, the coal beds of the Boulonnais, the North of France, the Channel Islands and Isle of Portland, the new red sandstone of Staffordshire, Cheshire, and Lancashire, the Silurian old red sandstone and coal districts of Shropshire, Herefordshire, Monmouthshire, and South Wales.

In 1830 and 1831 he was present during many of the stirring scenes of the Belgian War of Independence and the last siege of Antwerp; at which time also he made the acquaintance of the lady who soon after became his wife, a daughter of Dr. Stather, a gentleman of

VOL. XXVIII.

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position in the Island of Nevis. This lady, with a son and two daughters, survives him.

In 1833 he was presented to a small vicarage near Poole, where in addition to his clerical duties he discharged the functions of a magistrate. His ardour in pursuit of travel and geology exposed him to a severe illness which culminated in rheumatic fever, which so crippled him that he was induced in 1839 to try the effects of a warmer climate, and as the investigation of a new country had peculiar charms, he resolved to visit the colony of New South Wales, which in those days included what are now Victoria and Queensland. He had also a kind of special mission from his brother geologists to investigate the carboniferous formation of Australia. The ship in which he was making the voyage touched at the Cape of Good Hope, and Mr. Clarke seized the opportunity of making a survey of and report upon the geology about Cape Town. From the time he landed in Australia, in 1859, to the day of his death, he never ceased pushing forward his researches into the unknown regions which lay before him. It is no exaggeration to state that he knew every inch of the greater part of New South Wales proper, and from constant investigation of reports by explorers and others he knew the general character and geography, almost topography, of Australasia.

The modest income which is supposed to be the lot of those who undertake the duties of a clergyman, and which in the case of Mr. Clarke, averaged, up to 1861, less than £200 per annum, inclusive of the grant of £1,000 made in recognition of his services, prevented his issuing well illustrated works. Most of his publications appeared in a very modest form, either as Parliamentary papers, newspaper letters, or as papers in the various scientific journals. Latterly, the Government Printing Office offered some relief from the expense of publication, and the last edition of his last work is creditable to that establishment. The Government always had a high appreciation of his services, and never failed when in difficulties to utilise his knowledge. Thus in 1851, when the Government wished to have a proper report upon the mineral resources of the country, no fitter person could be found. The neighbouring colonies also appealed to Mr. Clarke upon all matters of a geological nature. His name was in fact a "household word" all over Australasia.

It is proved beyond controversy that he ascertained the auriferous nature of the country in 1841, ten years before the popular date of 1851. The main conclusions at which Mr. Clarke arrived from his geological investigations were, that matrix gold was the thing to be looked for, and that the carboniferous deposits of the main seams in New South Wales were Palæozoic.

To a geologist of Europe, with libraries of reference in every city, and with rapid means of locomotion and comfortable quarters every-

where, the difficulties of Australian geology are not apparent. When Mr. Clarke set out on his explorations there was no other means of travel but horses, with pack-horses for provisions, tents, and instruments. In some parts of the country there were no roads or landmarks of any kind, and the maps of the district were nearly useless, as being only skeleton outlines of boundaries. He had to carry on his work single-handed, and gradually to form his own library.

Mr. Clarke's travels extended to Tasmania, Victoria, and Queensland, and he has written various exhaustive reports relating to these countries. His writings have guided persons to various profitable gold mines, and the successful tin industries of Australia and Tasmania have been commenced from indications furnished by him.

In 1863 the Legislature of New South Wales voted Mr. Clarke £3,000, at a time when his various ailments seemed coming to a head, to enable him to secure a little comfort in his old age; but since that time his "pen of a ready writer" has never been weary; and we are almost tempted to say that his latter years have surpassed the former, for his facts seemed to have accumulated more quickly, and his experience being, of course, more matured, enabled him to seize upon the more salient points of the geology of the country. The fruit of his labours during this part of his life consists of a geological map of the whole colony, which has been compiled from his note-books and memoranda. Up to 1870 he never ceased from the work of his sacred calling, even when on his explorations; but on 1st October of that year, his increasing infirmities obliged him to retire from his parochial labours. He was thus in a position to avail himself of the improved locomotion afforded by the railways to revisit his old haunts, and to visit other places of interest, so as to fill up gaps in his former works.

He was an indefatigable observer of meteorological facts and of general natural history.

Mr. Clarke was elected F.G.S. in 1826. He was a member of the Geological Society of France, and held a diploma from the Imperial and Royal Geological Institution of Austria, F.R.G.S., and one of the early Fellows of the Zoological Society.

Mr. Clarke contributed largely to the periodical literature of England prior to 1839, and his poetical effusions are by no means undeserving of praise.

In 1876 he was elected F.R.S., and in 1877 he was awarded the Murchison Medal of the Geological Society of London. The terms in which the award was made express the results of his geological labours in Australia.

The excessive heat of March, 1878, combined with the labour of preparing a new edition of "Sedimentary Formations of New South Wales," proved too much for Mr. Clarke's strength. He was seized with paralysis on the 16th of that month; and though he rallied, so

that he was able to move about without help, and to arrange and label fossils received from Professor de Koninck on the 15th June, he was seized with a violent pain in the heart on the morning of the 16th, and before medical aid could be procured he was called to his long-earned rest.

It is proposed by the Government to purchase his collection of minerals, fossils, library, and geological maps, and with them to form a nucleus, under the name of the "Clarke Collection," of a grand Mining Museum.

ADOLPHE THÉODORE BRONGNIART, son of the illustrious Alexandre Brongniart, and grandson of Théodore Brongniart, an eminent architect, was born at Paris on the 14th January, 1801. Educated for the medical profession, he soon gave up that career in order to devote himself, under his father's guidance, to scientific pursuits, and early took a place among the first living botanists. In his nineteenth year he published his first and only zoological paper, containing the description of *Limnadia*, a new genus of Crustacea. In the following year he established the genus *Ceratopteris* for a curious and anomalous aquatic fern. In his twenty-first year he published his first palæontological memoir on the classification and distribution of fossil plants. He reviewed, in this paper, the various plant-remains then known, and grouped them in 4 classes and 19 genera. This memoir has been described as the starting point of the intelligent study of fossil plants. From this beginning Brongniart continued his labours and expounded the fragmentary remains of extinct floras, and traced their relation to living plants, and their position in the vegetable kingdom. He was singularly fitted for this work, for he already had an extensive acquaintance with the structure and classification of living plants, and he had so digested his knowledge that he was able to utilize it in the study of these obscure fossils. Seldom has a man made a more brilliant *début* than Adolphe Brongniart. The memoir on the classification and distribution of fossil plants, and another, which threw an entirely new light on the subject of the fertilization of living plants, were already finished, if not published, when he was about twenty-four years of age.

The study of the reproduction of organic beings had, up to his time, made so little progress that Brongniart obtained little assistance from previous workers. Without committing himself to any of the theories which had been suggested in explanation of the processes of fertilization, he confined himself to the observation and arrangement of facts. "Il est certains sujets," he says, "dont la difficulté éloigne et rebute les observateurs, tandis que la grandeur de leurs conséquences excite au plus haut degré l'imagination des hommes disposés à se contenter d'une hypothèse. Quant à moi, j'ai cherché d'abord à les

oublier toutes, à réunir des faits bien observés, à déduire de leur comparaison des conclusions de détail, et à former du rapprochement de celles-ci une théorie propre à les représenter."

Brongniart showed how the embryo is formed, little by little, by a process which he did not hesitate to say is identical over the whole of the vegetable kingdom. Microscopically small plants, the most majestic trees of our forests, our cultivated plants, all are reproduced by one and the same process.

For some years Brongniart prosecuted his investigations of living plants, and published, between 1824 and 1827, a new classification of fungi, a memoir on the natural order Bruniaceæ, and several histological and physiological memoirs. The labours and observations of six years in Palæontology were exhibited in his "Prodrome d'une Histoire des Végétaux Fossiles," published in 1828, and in his great work, "Histoire des Végétaux Fossiles," begun in the same year. The first volume, consisting of twelve parts, and containing 488 pages of letter-press and 160 quarto plates, was issued within a few months. The further progress of the work was interrupted by Brongniart's ill health, and it was not resumed for nine years, and then only three additional parts were issued, leaving this great work incomplete. The "Histoire" includes the whole of the Cryptogams, vascular as well as cellular, with the exception of the Lycopodiaceæ, to which the later plates are devoted; and the letter-press is suddenly stopped before the remarkable introduction to this natural order was completed.

In 1839 he brought out his well-known memoir on *Sigillaria elegans*. In 1849 he contributed to the "Dictionnaire Universel d'Histoire Naturelle," a short and popular review of fossil plants on the plan of his "Prodrome," exhibiting their botanical affinities and classification and their stratigraphical distribution.

It is worthy of notice that, as Brongniart began his scientific career with his labours on fossil plants, so the latter part of his life was devoted to a further investigation on the same subject. At the time of his first investigation only few and imperfect specimens had been obtained. Fifty years later his friends, Messieurs Renault and Grand d'Eury, sent him, from the environs of Autun and St. Etienne, a quantity of specimens of seeds which had been converted into siliceous masses of a texture as fine as that of the most beautiful agates. From these masses Brongniart separated transparent flakes, and, by the aid of the microscope, made out minute details of their organization, cells with excessively thin walls, vessels with delicate membranes, nebulosities which are the first indications of the formation of tissues, organisms, in fact, of dimensions so small as can only be detected by high powers of the microscope. He found, in fruits dating from remote ages, all the particulars of organization which he had formerly observed in living plants. No one had hitherto imagined it possible

that we should one day see in the substance of a hard and translucent stone indications of the sap which had, in former ages, circulated in the delicate vessels of a living plant, of the grains of pollen bursting from the anthers, and of the presence of the minute ovules where appearing. In his memoir on this subject, the last he ever published, Brongniart not only disclosed the evidence of a remarkable and varied gymnospermous vegetation in Carboniferous times, but the structure preserved in these Palæozoic plants led him to suspect the existence of a curious and hitherto unobserved detail in the organization of the ovule of living Gymnosperms. After having satisfactorily shown that the beautifully silicified tissues of the plants of St. Etienne belonged to plants of which we find analogous species in Mexico, he confidently asserted that a peculiarity, a cavity for the reception of the pollen, never previously observed in living specimens, would be found in the species of that country, and he subsequently had the satisfaction of exhibiting, to the Académie Française, some plants living in the hothouses of the Museum which had a pollen cavity of which a plant dead countless ages ago had furnished us with the first example.

Brongniart did not live to complete this important research. The decline of his health first manifested itself in a failure of sight brought on by excessive use of the microscope, and he owed it to the assistance of his friends and colleagues, Messieurs Bureau, Cornu, Renault, Grand d'Eury, and other friends, that he was able to work on at the investigation as long as he did. From the time of the siege of Paris his health, affected by the privations and sufferings he then underwent, steadily declined, but he retained to the end of his life his tranquillity of mind, his intellect, and his memory. He took an affectionate interest in the progress of a grandson, whose first steps in the career of science he hoped to guide. At length, in February, 1876, foreseeing that his end was near, he desired to be surrounded by his family, and expired in the arms of his eldest son.

Less fortunate than his father, Adolphe Brongniart had, some years previously, lost the affectionate wife whom he had married in early life. He left two sons and several grand-children.

The herbarium left by A. Brongniart has been placed in the Botanical Gallery (of Paris), and his unique and beautiful collection of fossil plants forms one of its greatest ornaments.

Brongniart was elected a member of the Academy of Sciences in 1834, in the place of Desfontaines, and in the same year he was appointed Professor of Vegetable Physiology in the Museum of Natural History. In 1840 he was appointed a foreign member of the Geological Society of London, and in the following year he received the Wollaston Medal, in consideration of his important works on fossil plants. In 1852 he was elected a foreign member of the

Royal Society, and was also appointed Inspector-General for Science of the University of Paris.

With regard to his scientific character, Brongniart has been characterized as the Linnæus of fossil botany; not so much a great discoverer as a great systematizer; introducing lucid order and general principles into the study of the materials which had been already collected. To those materials, also, he undoubtedly added much by his own observations, and probably (as in the case of Linnæus) his example gave a stimulus to the exertions of his opponents as well as of his followers. He was eminent, not only for industry, accuracy, and judgment, but also for the clearness and neatness of his scientific writings.

Brongniart's favourite branch of study is one in which exceedingly rapid progress has been made, since he was at the height of his fame, and in which rapid progress is still making. The researches of Heer, Unger, Ettingshausen, and others, in the fossil plants of the Tertiaries, have opened to us almost entirely new departments of Palæo-botany; the microscopic studies, which have been followed up with so much zeal and success by some in our own country, have thrown a greater amount of new light on the structure of the Palæozoic vegetation. But the name of Adolphe Brongniart deserves to be held in honour as long as the sciences of botany and geology are cultivated; and, however far the knowledge of these subjects may be carried, such works as his treatise on the structure of *Sigillaria* must always be valued as models of accurate examination, lucid exposition, and caution in drawing conclusions.

Adolphe Brongniart's careful investigation and illustration of the veining of recent ferns (*see* his "Histoire des Végétaux Fossiles," vol. i, p. 148) probably suggested some of the more recent methods of arranging that family of plants.

As a teacher he was remarkable for courtesy and kindness, and readiness to help students in that branch of science to which he had devoted himself.

ELIAS MAGNUS FRIES was born at the parsonage of Femsjö, in Småland, in the southern part of Sweden, on the 15th August, 1794. He appears to have inherited from his father a love of natural history, and his parents carefully fostered and encouraged this taste, in hopes of thereby supplying to him the place of companions and playmates. At the age of twelve he was already familiar with many of the plants of the neighbourhood. In one of his rambles, in 1806, his attention was attracted by the large and peculiar *Hydnum coralloides*, and it was this discovery, he said in after years, which awakened in him a desire to study the Fungi. The very next day he set to work and learnt the few genera then known from Liljeblad's Swedish Flora. In the year 1808, when Sweden was ravaged by war and disease, it

became necessary to close the school at Wexio, which Fries attended, and he remained for a time at home. He made use of this period of leisure to describe all the Fungi he could find, and before 1811 he had succeeded in distinguishing three or four hundred species, but not having access to books on the subject, he gave them temporary names.

In 1811 he left the Gymnasium, and went to the University of Lund. At Lund he continued to give all his spare time to Botany, and had the satisfaction of finding many plants new to him. He spent much of his time in the library studying botanical works, in which he found the names of many of the species he had described. While at Lund he was fortunate enough to make the acquaintance of two distinguished naturalists, Retzius and Agardh, who put into his hands the mycological works of Persoon and Albertini, the best then existing. During the year 1812 he studied *Hypoderma* (Ustilagineæ, *Æcidomycetes*). While earnestly studying for the degree of Doctor of Philosophy he still found some leisure for his favourite pursuit. He took the degree of Ph.D. in 1814, and was also in this year appointed Docens of Botany. In 1819 he became "Adjunkt" and received the title of Professor in 1834.

From the time of taking his degree Fries devoted himself to the study of the Fungi, and went with this view for a time to Copenhagen. About the year 1814 he brought out his earliest important work, his "*Novitiæ Floræ Sueciæ*;" and his "*Observationes Mycologicæ*" was published, in the years 1815—1818, at Copenhagen. In 1814 he began to write his "*Monographia Pyrenomycetum Sueciæ*," which work he presented in parts from 1816 to 1819 to the Academy of Sciences, in Stockholm.

In the year 1816, having come to the conclusion that the method of describing and classifying hitherto adopted was by no means satisfactory, Fries began to work out a new system and to make fresh investigations of all the Fungi. This new system was based upon a minute examination of their different stages of development, and of the morphological relations of their different parts. The result of this investigation—the "*Systema Mycologicum*," in three volumes—he published between the years 1821 and 1829, and a supplement appeared in 1830.

In 1828 Fries published his "*Elenchus Fungorum*," in which he described some of the Fungi, of which great quantities had been sent to him from abroad.

Hitherto Fries had been absolutely prevented by want of means from indulging his ardent wish to explore foreign countries in search of specimens, but in the year 1828 he was at length able to visit the northern part of Germany and the Museum at Berlin, and had the opportunity of extending his knowledge of Lichens, of exotic Fungi, as well as of studying the literature of these plants.

After the publication, in 1829, of the third volume of his "*Systema Mycologicum*," he again subjected the Fungi to a close investigation, comparing them with his own descriptions. Having thus revised and completed his observations, separated the *Discomycetes* from the *Hymenomycetes*, &c., he published the results of his observations in his "*Flora Scanica*" in 1835.

Fries became Demonstrator in Botany at the University of Lund in 1828. In 1834 he was translated to the University of Upsala as Professor of Rural Economy, with which, after the death of Professor Wahlenberg in 1851, the chair of Botany was united. He discharged these teaching duties until 1859, when he retired on a pension.

At Upsala he found new fields for his mycological studies, and published his "*Epicrisis Systematis Mycologici sen Synopsis Hymenomycetum*" in 1836—1838.

In the year 1844 the Academy of Science in Stockholm resolved to be at the expense of a series of engravings of all the species of Fungi principally belonging to *Hymenomycetes* that could not be preserved in a natural state, and gave the superintendence and direction of this work to Fries. This collection, containing now from 1,600 to 1,700 coloured figures, is one of the richest and most extensive in existence. Eleven parts, with 110 plates, have been published under the title "*Icones selectæ Hymenomycetum nondum delineatorum*." These admirable figures, to the preparation of which his latter days were devoted, afford great help to the student in one of the most difficult parts of botany.

The last large work of Fries was the "*Hymenomycetes Europæi sive Epicriseos Systematis Mycologici, editio altera*," published in Upsala, in 1874.

Fries had also, at an early age, studied the Lichens no less thoroughly than the Fungi, and he essentially reformed the descriptions and systematic arrangement of these plants. His "*Lichographia Europæa reformata*," published in Lund in 1831, was long regarded as a principal work in lichenographical literature, and the successively published parts of his "*Lichenes exsiccati Sueciæ*," form a remarkably valuable series.

He also published explanations and critical examinations of some of the more difficult genera among the higher plants, for instance *Hieracium*, *Salix*, *Carex*, and several others. He wrote Floras of the whole of Scandinavia, and of separate parts of it, and in his "*Novitiæ Floræ Sueciæ*," "*Botaniska Notiser*," &c., he gave descriptions of many new plants discovered by himself.

His *Herbarium Normale*, collected at great expense, and with incredible industry, contains dried specimens of many of the rarest plants of Scandinavia. It was issued in fifteen numbers, during a period of over twenty years, the last being dated 1857, and is con-

sidered to be of the greatest value for the study of the plants of northern Europe. This collection of typical plants is quoted by Fries throughout the first part of his "Summa Vegetabilium Scandinaviæ."

Fries has also written treatises on Agriculture and on Practical Botany, on the Nomenclature of Plants, and on the History of Botany. In the "Botanical Excursions," 1852—1864, he has very successfully popularised his science, and the book has been read with lively interest beyond his own country.

Important, however, as were many of Fries' labours on Phænogamic plants and Lichens, his future fame must rest upon his reformation of Fungology. The brilliant discoveries of later observers seem at first sight to eclipse altogether what was done so many years before, but they are quite in a different line, and doubtless have been assisted by the labours of Fries. His arrangement of the genus *Agaricus* alone has been described as a great effort of genius, and every division of his mycological system is full of matter for reflection. To appreciate his system, full allowance must be made for the state in which he found mycology and the comparative imperfection of microscopes.

Fries was eminent as a systematic botanist, and the Friesian system is still followed by some Swedish writers. The system was first published in the "Flora Scanica," 1835), and an outline of it will be found in Lindley's "Vegetable Kingdom."

With regard to the relationship of species, his point of view appears to have been the same as that taken by Linnæus, "A species is each form brought forth by the Creator in the beginning."

Fries had remarkable fluency and power of expression both in writing and lecturing, and this faculty no doubt contributed much to his influence in gathering round him a large number of disciples. Foreign scientific men seldom visited Upsala during the last forty years of his life without making the acquaintance of the celebrated botanist, whose amiable and engaging manners and kind disposition made him beloved by all who knew him.

Fries continued his scientific labours into the last years of his life. In his eightieth year he published a new and improved edition of his extensive work "Hymenomycetes Europæi," and about a week before his death he completed an essay for a foreign periodical. He died on the evening of the 8th of February, 1878, to the last actively useful.

In 1851, Fries had been appointed Director of the Botanical Museum and garden attached to the University of Upsala, and in 1853 became Rector of the University. He was a member of many learned societies, Swedish and foreign. In 1835 he was elected a Foreign Member of the Linnæan Society, and in 1875, a Foreign Member of the Royal Society.